

R E P O R T R E S U M E S

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SCHOOL BUS GARAGE.

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DESCRIPTORS- *BUS TRANSPORTATION, *BUS GARAGES, PLANNING,
TRANSPORTATION,

COUNTY BOARDS, COUNTY SUPERINTENDENTS, SCHOOL PERSONNEL,
AND ARCHITECTS PLANNING BUS GARAGE FACILITIES WILL FIND THIS
PUBLICATION USEFUL. DECISIONS NEED TO BE MADE IN REGARD TO
WHO WILL USE THE GARAGE, WHAT PURPOSE IT SHOULD SERVE, AND
WHAT KIND OF SPACES ARE NEEDED. SITE SELECTION FACTORS TO BE
CONSIDERED ARE LOCATION, PARKING SPACE, MANEUVERING SPACE,
GASOLINE PUMP LOCATION, ACCESS ROADS, DRAINAGE, AND GENERAL
FACTORS SUCH AS SOIL CONDITIONS AND NOISE. SIZE OF THE GARAGE
IS DEPENDENT UPON FLEET SIZE AND DUTIES TO BE PERFORMED.
SPECIAL CONSIDERATIONS ARE VENTILATION, INSULATION, HEATING,
LIGHT, ACOUSTICS, DUST, FLOOR, AND DOORS. TOOL AND GENERAL
STORAGE, WORK AREA SIZE, TRAFFIC CIRCULATION, CEILING
HEIGHTS, AND SPECIAL AREA NEEDS MUST ALSO RECEIVE CAREFUL
STUDY. ATTENTION TO STRUCTURAL INFORMATION IS A MUST. UTILITY
SERVICES MUST SERVE THE SPECIAL NEEDS OF THIS KIND OF
FACILITY. SEVERAL DIAGRAMS ARE INCLUDED WHICH SUGGEST SPACE
ARRANGEMENTS. (RH)

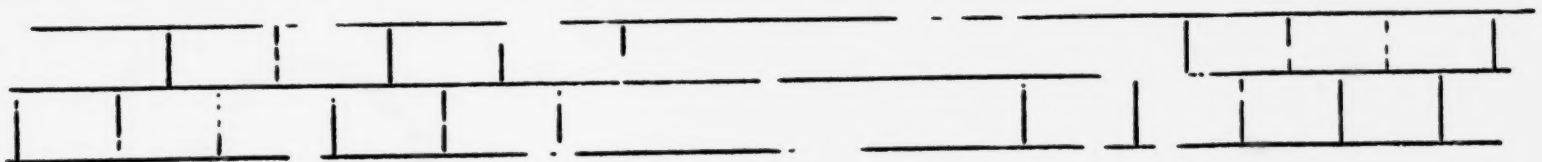
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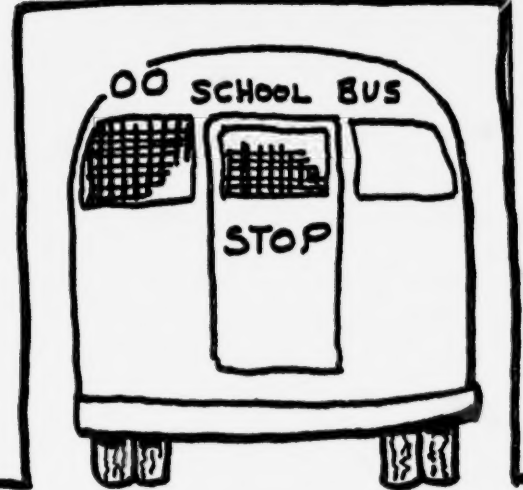
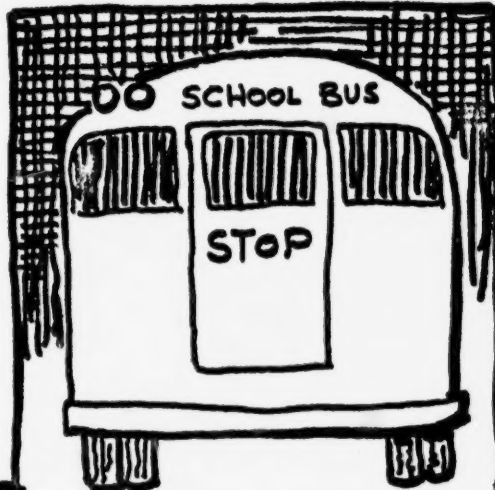
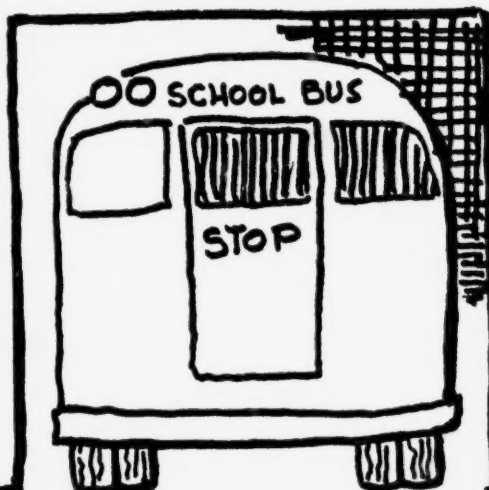
SCHOOL BUS GARAGE



SAFETY

EFFICIENCY

ECONOMY





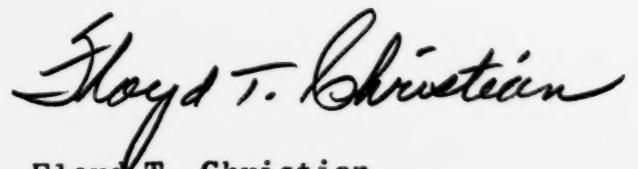
TAKE THE RIGHT TURN....



FOREWORD

In planning for a safe, efficient and economical school transportation program, much depends upon the maintenance personnel having adequate garage facilities in which to carry on a program.

This publication should serve as a valuable guide to county boards, county superintendents, school personnel, and architects in planning and equipping such facilities.



Floyd T. Christian
State Superintendent of
Public Instruction

ACKNOWLEDGMENTS

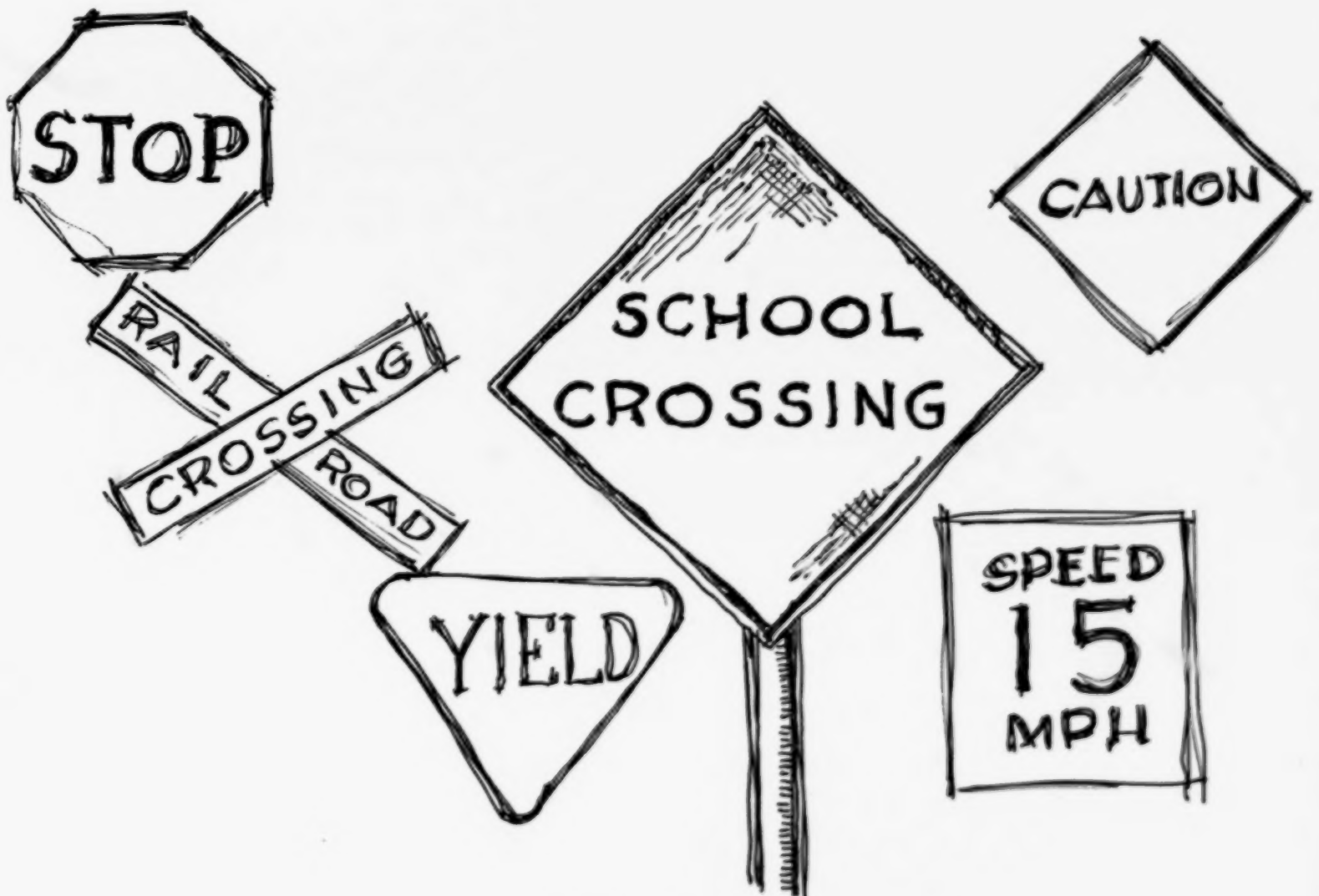
The material in this guide is the result of a team effort on the part of staff members of SCHOOL TRANSPORTATION and the SCHOOL PLANT PLANNING SERVICES of the Florida State Department of Education.

The material was compiled by Steve Palladino, Transportation and Charles W. Stripling, School Plant Planning Services with the advice and direction of J. Pope Baird, Assistant Director, Administration.

Final publication was organized, edited and illustrated by Charles W. Stripling.

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SO YOU ARE GOING TO BUILD A BUS GARAGE

WHAT



When any worthwhile building project is begun, there must be plans. We mean plans for the use of the building. Plans for the construction will come later. Maybe a better word is requirements that the building must fulfill. What operations will take place in the building? What spaces are needed and what equipment will be used? All of these things and more to follow must be assembled so that your architect will have a complete picture of your county transportation and maintenance program. Only in this way can you have a building to fit your program rather than fitting your program into a building.

Would you try to overhaul a motor without a set of mechanic's tools? Service and maintenance can only be provided in an efficiently-planned garage.

WHO



Who works on these building requirements? The people who are going to work in the building. Someone must be in charge to level things off but ideas should come from every working level.

HOW



In order to plan you must have meetings. These meetings should be short and well organized. Make assignments for research and reports. We suggest a breakdown like this:

- a. Administration
- b. Shop (Mechanical and Maintenance)
- c. Lubrication and Tires
- d. Paint and Body
- e. Cleaning and Washing

WHEN



To get the job done you must set deadlines. Definite meeting schedules are a must. In your building schedule allow three months for this requirement planning.



**TAKE A CLOSE LOOK
AT YOUR PROGRAM**

CHECK LIST



SELECTION OF SITE



A. Location

Think about where the vehicles come from that are to be serviced. The ideal location would be centrally placed between the termination points of the morning routes. But these routes may change. So maybe near the source of supply of the repair parts is a factor to be considered.

B. Parking space

1. Large enough to store all of the school buses which are assigned to this operation during the summer months
2. Space for vehicles other than school buses that are to be maintained at this location
3. Consideration as to the future size of the vehicle fleet

C. Maneuvering space

1. Traffic pattern of vehicles entering or leaving compound
2. Area needed to maneuver bus in and out of garage

D. Gasoline pump island

1. Location of gas pumps in respect to traffic pattern and garage
2. Storage land for buses waiting to be fueled

E. Access roads

1. Off of busy traffic arteries
2. Inconvenient for the casual visitors

F. Drainage

G. Other building on site

Is this site to be a central compound for other school administration activities such as:

- (1) School administration
- (2) School building maintenance shops
- (3) Warehousing
- (4) Cold storage

H. Building zones

I. Soil and soil-bearing conditions

J. Noise level in relation to nearby activities

PERSONNEL ORGANIZATION



Is the organization to include the following personnel classifications, and how many of each?

1. Supervisor
2. Secretaries or clerks
3. Chief Mechanic
4. Parts man
5. Mechanics
6. Helpers
7. Painters
8. Drivers

FACTORS DETERMINING SIZE OF GARAGE



A. Number of buses

Includes all school buses which are to be maintained and serviced at this location

B. Number of other vehicles

Includes trucks, cars, farm tractors, etc., which are to be maintained and serviced at this location regardless of their departmental assignment



C. Other maintenance duties

Are these facilities to be used for repair and for fabrication of equipment as lawn mowers, play ground equipment, etc.?

D. Ratio of the number of mechanics to the number of school buses

1. It is generally recommended that one mechanic is needed to service and repair approximately 15 school buses more or less, depending on the age and condition of the vehicle and the amount and type of service that is required of the vehicle.
2. Consideration should also be given to the need for additional mechanics to service and repair vehicles other than school

buses assigned to the operation and to the needs of other forms of repair or prefabrication.

E. Ratio: of the number of mechanics to the number of vehicle work stalls used for general repairs—

A ratio of one journeyman mechanic to one work stall is ideal; however, there are other factors to be considered.

(a) A helper may be assigned to a mechanic and use his work area.

(b) A minimum size garage for a small fleet employing one mechanic should have at least two work stalls and additional floor space for other purposes.

(c) When preliminary plans call for over eight vehicle work stalls, not including the paint room or tire department, a thorough study should be made to re-evaluate the need. When there is a need for an eight stall garage, it may be preferable to build separate structures for the paint and body shop and the tire and lubrication centers.



THE ARCHITECT NEEDS
INFORMATION ABOUT
WHAT YOU NEED.....

GENERAL OPERATIONS



Outline the extent to which vehicle maintenance is to be carried out so as to determine if the necessary facilities and equipment shall be a part of the building plans or of a portable nature.

A. Job descriptions and facilities and equipment needed

1. Engine removal
 - a. portable "A" frame type hoist or
 - b. permanently suspended chain or cable type hoist or
 - c. same as "b" except hoist travels on overhead rail
2. Engine rebuilding--enclosed dust-free machine room
3. Engine overhauling--standard vehicle work stall
4. Brake repairs
 - a. brake lining machine permanently located in machine room
 - b. brake drum lathe permanently located in machine room
5. Differential and transmission overhaul--stationary type hydraulic press, machine room location
6. Tune up and carburetion
 - a. properly equipped standard work stall
 - b. wash basin in machine room
 - c. exhaust outlet system having a flexible tube for attachment to the vehicle exhaust pipe for indoor engine testing
7. Starter and generator overhaul
 - a. small lathe located in machine room
 - b. properly equipped standard work stall
 - c. exhaust outlet system having a flexible tube for attachment to the vehicle exhaust pipe for indoor engine testing.

8. Glass and upholstery replacement or repair--ample room for sewing machine, large table, belt sander and material storage needed for repair operations
9. Lubrication
 - a. At least one vehicle work stall needed for the installation equipped with a twin post lift
 - b. Oil and grease storage
10. Tire department
 - a. Unless the mounting and dismounting of tire and wheel assemblies are to be farmed out, ample space in the more remote area of the garage or compound should be set aside for this operation.
 - b. Aside from tire storage and mounting area, floor space will be needed for a stationary safety cage, a tank for air leak testing and possibly a dismounting press.
11. Paint and body
 - a. Permanent type paint booth and possibly a body shop
 - b. If a body shop is not in the planning, floor space, in addition to the paint room, should be provided for stationary equipment such as a 6' metal break and a 4' squaring shear
12. Bus Washing

Outside washing slab and drain or see Paint Room, Section H.

GENERAL REQUIREMENTS FOR BUILDING

- A. Ventilation, insulation and heating
 1. The use of roofing material other than metal to provide insulation from the sun
 2. The use of insulation on the under side of bare metal roofs

3. Gable fans or other means to provide adequate ventilation
4. If windows are used for ventilation, should they be located high up in the walls so as not to take up wall space that could be used for other purposes?
5. Overhead type doors at entrance of each work stall
6. Central type heating system--if the paint booth is to be heated from the same source, the piped hot water or steam type system may be more feasible. Forced hot air systems, unless carefully filtered, may be a source of dust in the paint booth.

B. Light--source and location

1. Sky lights in roof
2. Overhead doors constructed of transparent lucite-type plastic
3. Windows in overhead doors if not constructed of transparent materials
4. Fluorescent-type lights suspended from overhead between the work stalls and at the head of each work stall
5. Fluorescent-type lights recessed or mounted near floor on side wall adjacent to lubrication rack.
6. Paint room--vapor-proof fixtures

C. Acoustics

1. If little can be done to better the acoustical properties, the supervisor's office should be located away from noisy equipment and operations whenever possible.
2. Block partitions separating body shop and tire department from the main garage area will tend to reduce the noise

and dirt related to this operation.

D. Control of dust

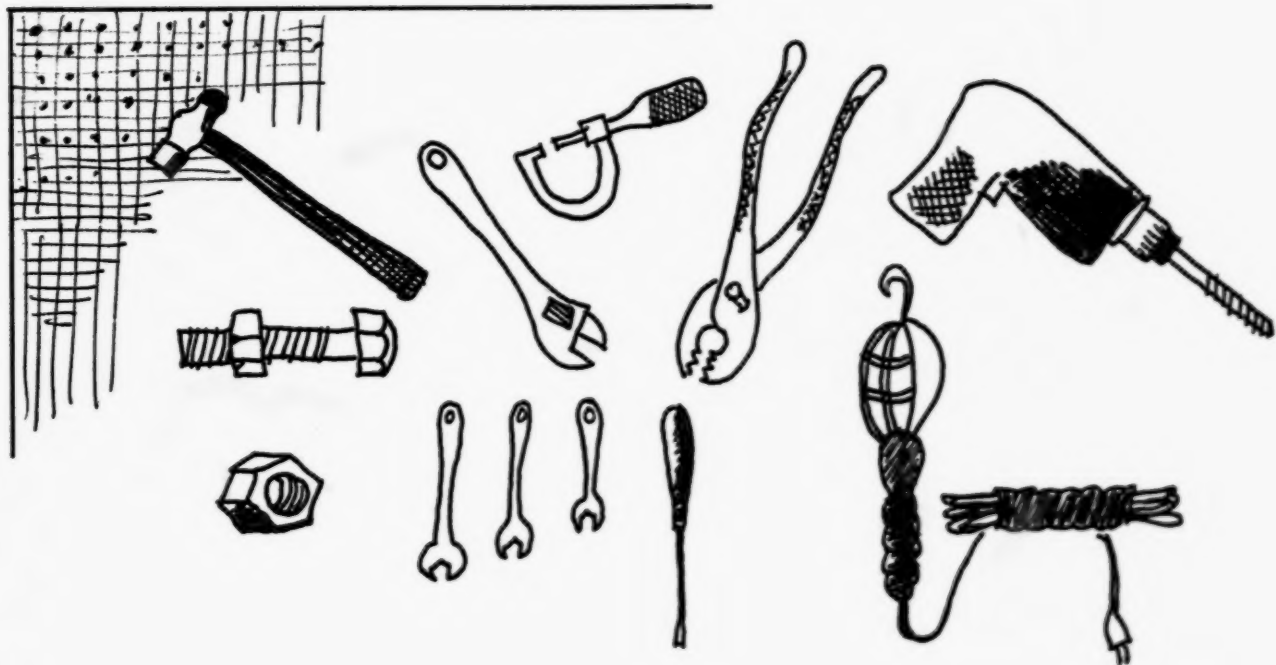
1. The area surrounding the garage should be hardsurfaced.
2. Isolate body shop from rest of garage.
3. Seal finish of garage floor to retard penetration of grease.

E. Type of floor

1. Sloping or flat
2. Floor finish--smooth trowel--hardener added
3. Inclined apron of adequate width along front of entrance doors.

F. Doors and apron

1. Doors at entrance to vehicle work stalls should have an approximate opening of 12 feet in width by 11 feet high.
2. A broad concrete apron located in front of the vehicle entrance is essential. In crowded situations additional work area can be obtained by the construction of a porch-type shelter over this apron which should have a width of approximately 10 feet.
3. The area adjacent to the gas pumps should be concrete. The gas and oil drippings will deteriorate asphalt paving.



G. Tool boards and storage

Special tools used for various repair operations are more accessible when placed on racks or tool boards. The wall at the head of the vehicle stalls can be used for this purpose.

Additional area for tools can be had by projecting partitions from the rear wall between stalls. The partitions can be faced on both sides with pegboard and should not be over 6 feet high. The length of the partition would depend largely on the depth of the stall and personnel traffic pattern.

H. Size of work areas

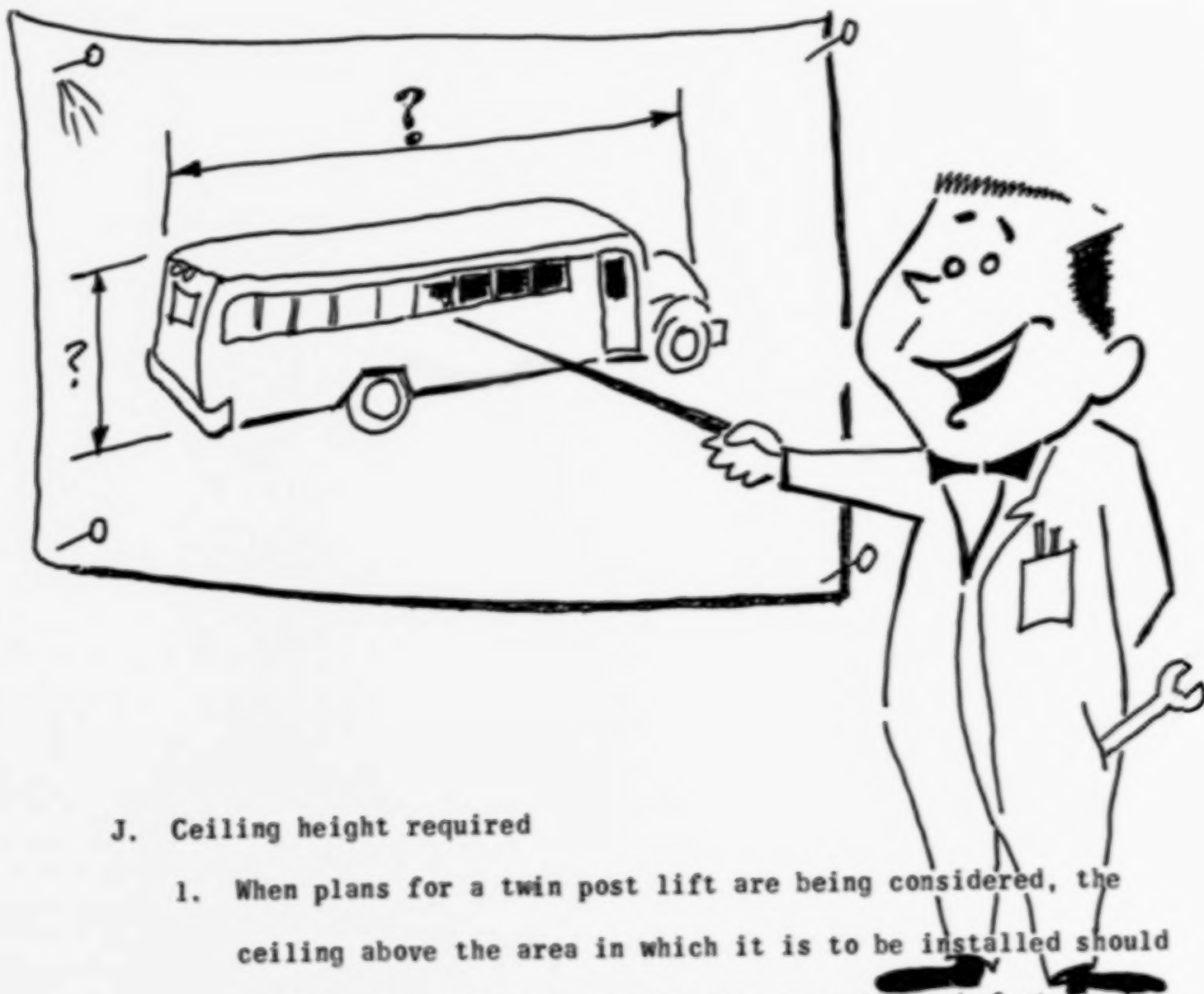
1. The space needed for housing a large school bus in a vehicle work stall including the placement of one movable steel work bench and mechanic's portable tool cabinet is an area approximately 16' x 50'.
2. When separate areas for the placement of stationary and portable equipment is not in the planning, an additional 10 feet (minimum) should be added making the work stall 60 feet deep.

I. Traffic circulation

1. Obstructions that restrict walkways such as roof support posts should not be placed between vehicle work stalls.
2. The garage floor plan should include areas at the head of all work stalls that can be used for walkways leading to the parts room or machine shop areas from each end of the building.



YOU NEED ROOM TO
"LET YOUR HAIR DOWN."



J. Ceiling height required

1. When plans for a twin post lift are being considered, the ceiling above the area in which it is to be installed should be high enough to account for the approximate 6-foot stroke of the lift posts, a total of approximately 16 feet.
2. It is practical to limit the volume of space within a room as much as possible. Since the height of the larger school buses ranges from 9 to 10 feet and considering the need to have work space above a bus housed in a paint room, the ceiling height should be approximately 16 feet.
3. The ceiling height of a body repair stall should be approximately 16 feet.
4. The clearance above a large school bus parked in a vehicle work stall should be at least 3 feet.
5. Areas used for purposes other than on vehicle repairs may have a ceiling height of approximately 10 feet.

K. Office space required

1. Office space is needed for the supervisor of transportation when a county classifies a position as such.
2. A glassed-in type office is also needed for the chief mechanic regardless of the operation's size.

L. Day room for bus drivers

- It is practical to have a waiting room for drivers adjacent to office area.

M. Classroom

- It is ideal to have a classroom large enough to accommodate all the drivers at one time for training purposes. If this is not feasible, it would be beneficial to have one large enough to hold group conferences. This classroom can be in combination with the day room. Depending upon the roof height above the offices and parts room area, an upper story classroom can be erected at this location.

N. Toilet rooms

- Restrooms are essential for both male and female employees at this location. Tiled walls and floors are practical in garage restrooms for ease of maintenance.

O. Showers

- Showers can be utilized when installed in the men's rest room providing the practice of taking baths at the garage after work conforms to the habits of the personnel involved.



PARTS ROOM

- A. Size--The size of the parts room will depend upon the size of the vehicle fleet being serviced and the approach to the tire storage problem. A medium size operation can utilize an area equivalent to a vehicle work stall for parts storage including tires. A larger fleet will need at least an area this large for parts storage alone. Additional provisions will have to be made for tire storage.
- B. Security--A parts room completely surrounded by some type of partitioning is essential.
- C. Location--A parts room should be centrally located in respect to the general repair area and housed under the same roof. The parts distribution window or center should be accessible from within the garage.
- D. Open or closed cages--The location of the parts room will have a bearing on the type partitions needed; however, under many circumstances, wire type partitions are practical.
- E. Dead storage--A small separate building or room in a more remote area of the compound is practical for storage of slow-moving used parts.

PAINT ROOM

- A. The floor area needed in a paint booth should measure approximately 16' x 50'. A separate storage room constructed to comply with the local fire codes should be used for storage of all paints and materials related to this work.
- B. The larger operations that carry out an extensive paint and body program have a need for a body shop in addition to the paint booth. The body shop should be adjacent to the paint booth, away from the general repair area and should be 18' x 60'.
- C. It is desirable to have the interior walls and ceiling of the paint room finished in such a manner that few if any rafters or studdings are exposed and the surface sealed and painted.
- D. It is essential that an exhaust type ventilating system capable of changing the air within the paint room at a recommended rate be installed. Professional advice in regard to exhaust fan location should be sought.
- E. The filters used to clean the incoming air shall have the capacity to adequately process a volume of air equal to the amount displaced by the exhaust system.
- F. All electrical fixtures located within the paint room shall be of the explosion-proof type as approved by local codes.
- G. Aside from the construction of portable or swing-out cat walks, no shelves, benches, or cabinets should be constructed or installed inside the paint booth.

H. To utilize the paint room to its fullest extent, it may be equipped for washing buses. A drain should be provided with a dirt trap and an adequate water supply.



Safety

What specific hazards exist in a shop? Where do accidents occur?
What fire protection is needed? Should there be emergency doors?

STRUCTURAL INFORMATION

- A. Floor loads (weights of vehicles, etc.)--20,000 pounds should be used as a base for determining the weight of a large bus even though at present the empty weight of a large school bus is somewhat under this figure. This weight is distributed over a wheel base not in excess of 265 inches.
- B. Roof loads--will there be a movable hoist?
- C. Storage of heavy equipment
- D. Provide for lift or future installation
 - 1. The type lift more suitable for school bus servicing which involves vehicles of long wheel base design is the twin post lift. This system utilizes one stationary post lift located so as to raise the rear of the bus by the rear axle and a movable post for raising the front of the bus. The movable post is suspended in an enclosed rectangular pit. This system provides a safe and unobstructed working area underneath the bus when raised.
 - 2. The total lifting capacity of the twin post lift should be at least 20,000 pounds, preferably 24,000 pounds.
 - 3. With the possible exception of the open pit used with front end alignment equipment, open pits and the stationary type elevated drive on arrangements are not recommended for use in school bus servicing.
 - 4. For data on ceiling height and post travel height see "Required Ceiling Heights".

UTILITY SERVICES

A. Electrical

1. Type required for machines

- (a) Three phase service for air compressor motor and other large motors
- (b) 220 service outlets for electric welder and wheel balancing drive motor

2. Distribution

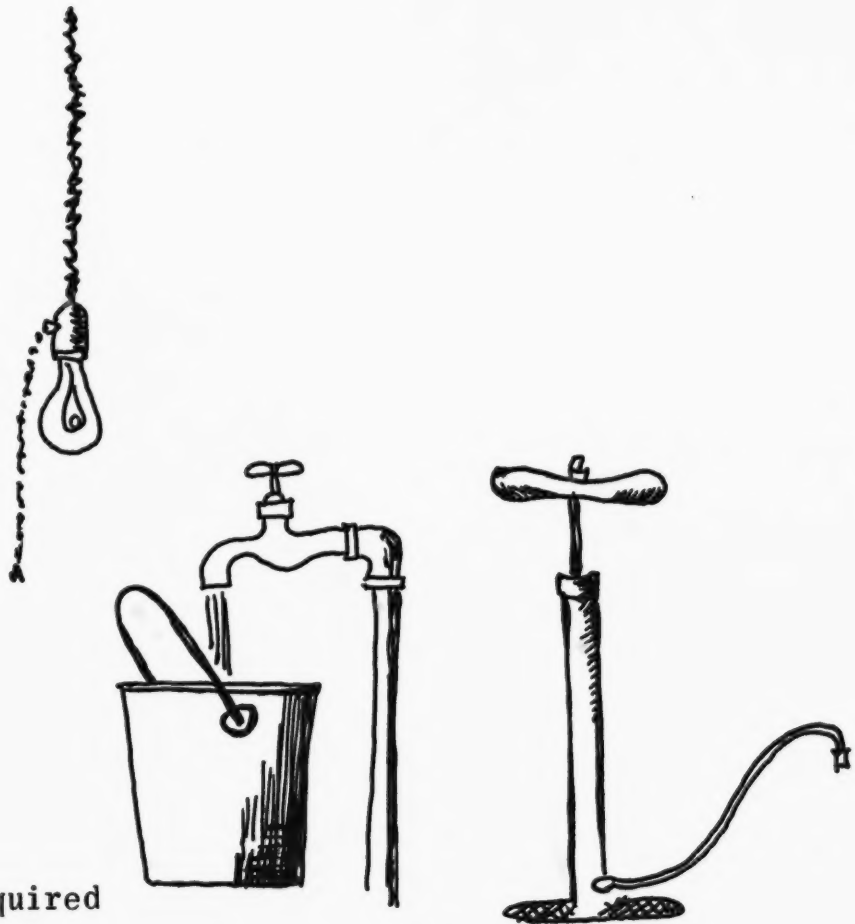
In addition to wall mounted outlets, suspend service outlets between work stalls at the head near work bench and rear near overhead doors.

3. Grounding of equipment

- (a) All stationary electrical equipment shall be properly grounded
- (b) All electrical service outlets shall have recepticals fitted for equipment ground plug.

4. Safety precautions

Air compressors shall be installed on outside of building, adequately caged with air tank pet cock accessible for drainage service.



B. Water

1. Pressure required
2. Amount of water for working or washing

C. Waste

Kind of waste and will any kind of traps be required?

D. Gas (if any)

E. Air conditioning (what areas)

F. Compressed air supply

A source of supply should be piped to the head of each work stall, machine shop area if separate and to the gasoline pump island.

G. Lubrication supply lines

Store motor oil and grease in a closed off room and pipe the source to the lubrication service area and gasoline pump island.

THE ARCHITECT

When you have finished your planning job, then let the architect begin his. He will render a service that will see you through to the finished building. The architectural firm will prepare preliminary plans for your approval. These will probably be revised many times. This is the time to make changes. Then working drawings are prepared. These final drawings and specifications are the material from which the contractor will submit a construction bid. The final drawings and specifications become legal documents when the county signs a contract with the builder.



"I WOULD
LIKE A WORK BENCH RIGHT HERE".....



THEY HAVE TO KEEP RUNNING!

The following diagrams will indicate the relationship of the elements and the functions of the shop building.



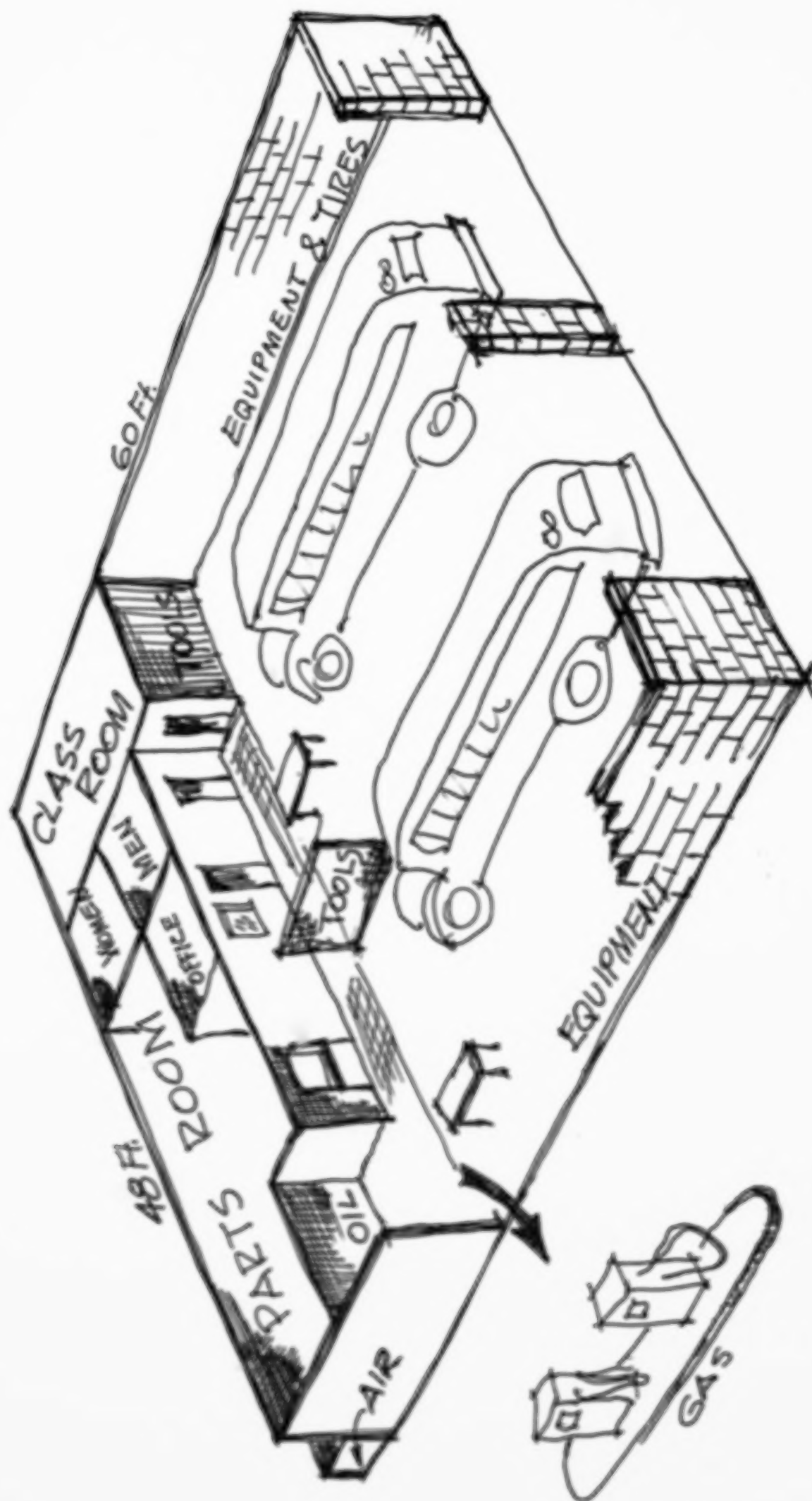


DIAGRAM A

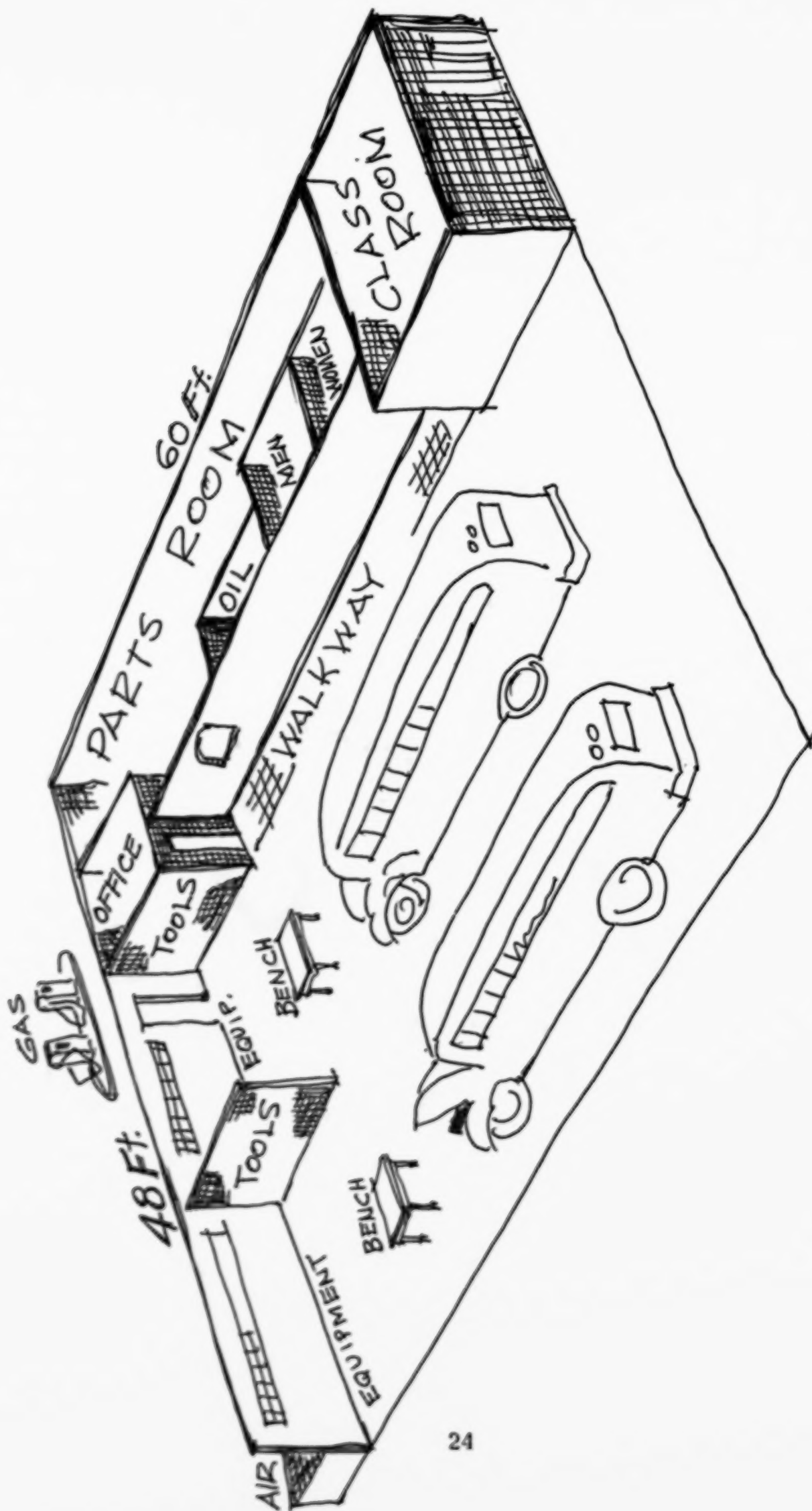


DIAGRAM B

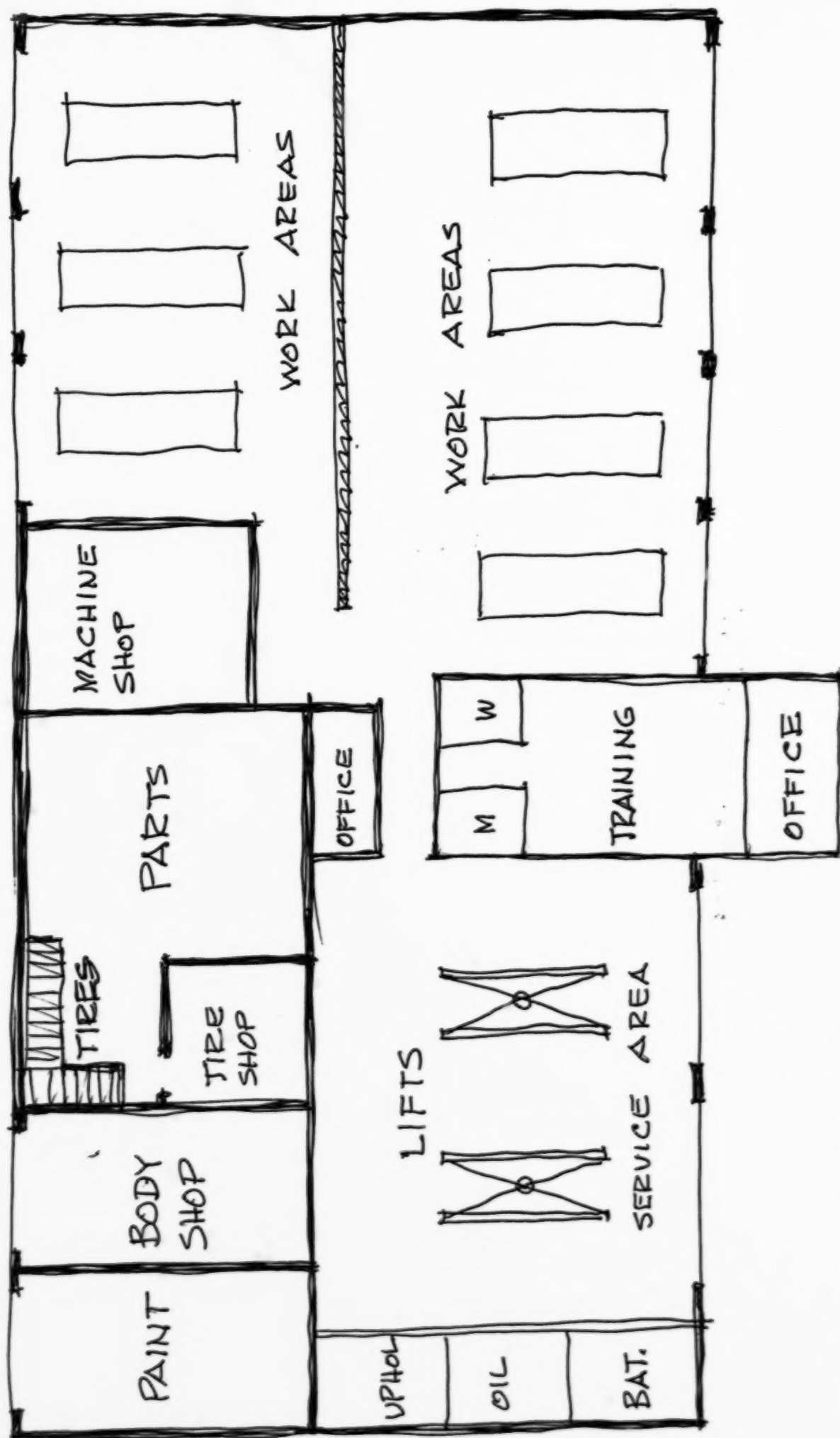
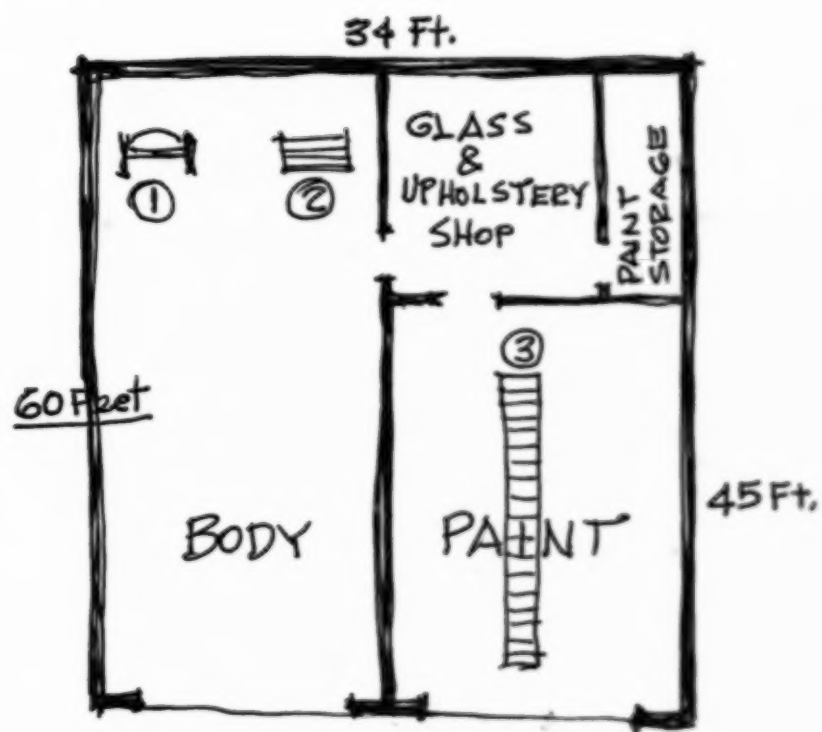
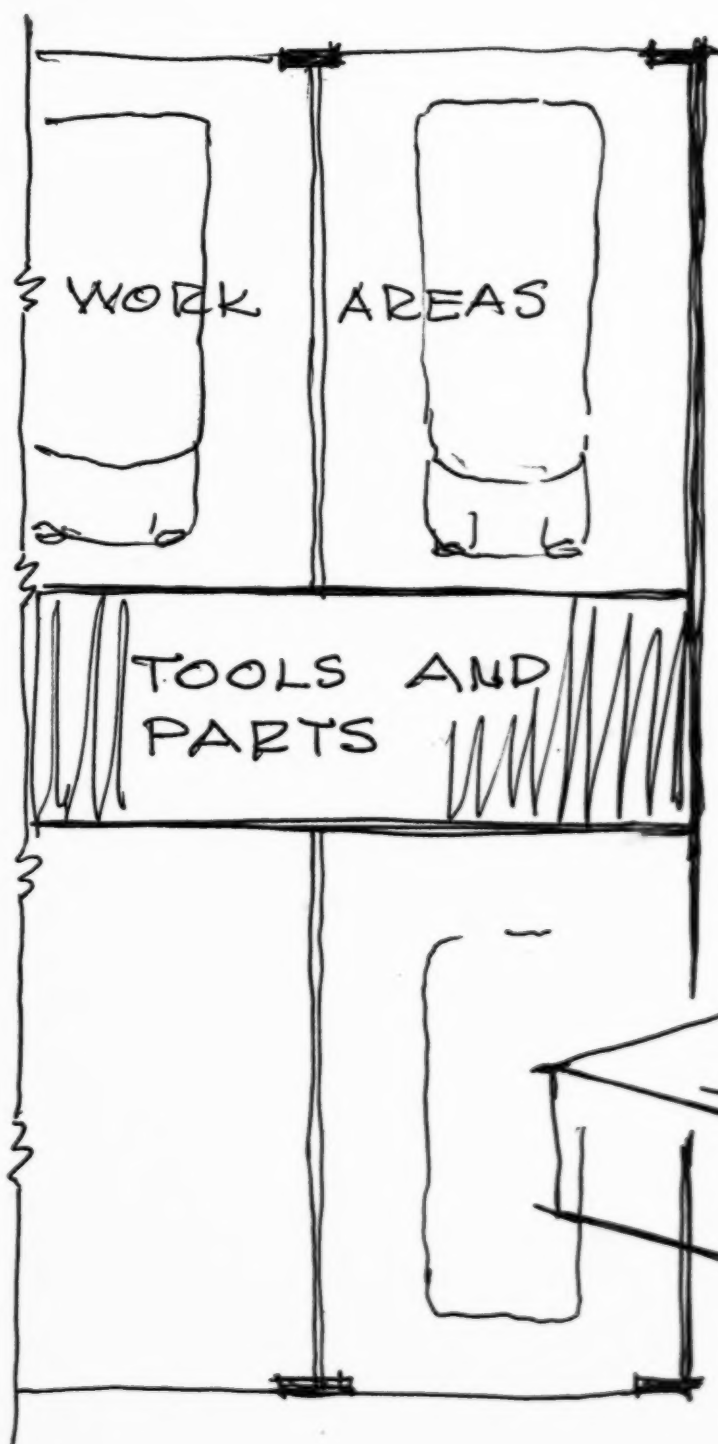


DIAGRAM C



- ① METAL BREAK
- ② SQUARING SHEAR
- ③ WATER BASIN WITH SUMP PUMP AND AIR EXHAUST TUNNEL.

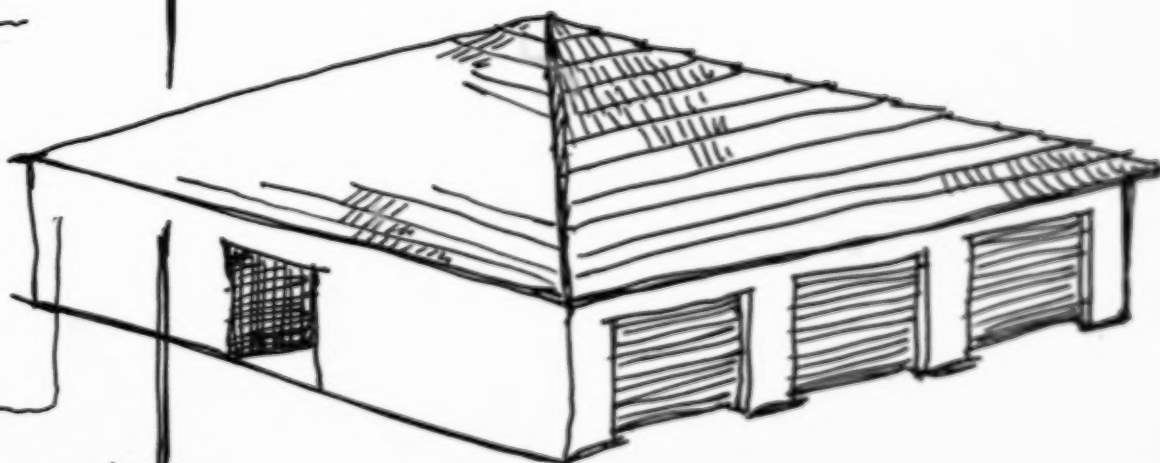


DIAGRAM D